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REVIEWS

Geology Physical and Historical. By H. F. CLELAND, PH.D. New York: American Book Co., 1916. Pp. 718, figs. 588.

This new textbook enters the field of general geology, a field already fairly well covered by a number of excellent books. The value of this new attempt will depend upon new material, new methods of treatment, or fewer infelicities than the other books have. The book occupies in its scope a middle ground among the books on the subject, being more ambitious than some and more modest than others. It will be used properly as a textbook in first courses in general geology in colleges and universities, where the students are at least fairly well prepared and somewhat mature.

The book is about the proper length best to serve its purpose, is pleasingly written, beautifully illustrated, and well bound. The presswork is exceptionally good. The reviewer has read the book through and knows of but one typographic error. The book is printed on glossy paper, and yet it is portable and durable.

The author of the book seems to be more at home in Part II, "Historical Geology," than in Part I, dealing with physical geology. This greater familiarity with the last portion of his subject is reflected in better English, more careful treatment, more detail, and greater accuracy and definiteness in Part II than in Part I. The best part of the book is that dealing with life, although some will think that this phase of geology is overdone.

There are a few glaring omissions. The origin of dolomite is avoided on p. 249. There is a chapter on earthquakes, but no presentation of the more important aspects of diastrophism, except as the subject is scattered through the chapters on structural geology, metamorphism, and mountains and plateaus. This is a weakness which is felt throughout the book. Proterozoic glaciation in Ontario, the causes of Permian glaciation, the Pleistocene Driftless Area, are not mentioned. There is no classification of the plant and animal kingdoms, an omission which depreciates the value of the excellent paleontological material in Part II.

With the exception of a few errors, such as plural nouns with singular verbs or vice versa, indefinite antecedents of pronouns, a rather free use of "the former" and "the latter," the English is good. The author uses words denoting time where place or number is involved in a monotonously regular way. The book must contain over a thousand cases of such misused words.

The origin and derivation of technical terms introduced throughout the book is a feature of much value. This point is somewhat discounted, however, by the use of some of these terms before they have been explained. For instance, the terms "travertine," "strike," "eskers," "basal conglomerate," "feldspars," "scoriaceous," "stoping," "schistose," "systems," "fauna," "phylum," are all introduced in advance of their explanation, and some of them are used repeatedly without explanation.

The scientific and pedagogical character of the book is marred by a certain odd looseness and indefiniteness of statement, which must militate against clear thinking and expression on the part of the student. On p. 298 lava is said to be "molten" rock; on p. 300 it is made clear that lava is rock dissolved rather than melted; and on p. 329 it is stated that igneous rocks "have consolidated from a state of fusion." The first part of the last sentence on p. 253 is true only when the surface of the ground is flat or nearly so. In Part II the terms "system," "group," "period," "era," etc., are defined, but these terms are used in various ways on pp. 383, 389, 392, 401, 384, 477, and 574. On pp. 89 to 92 various points are numbered for the sake of definiteness, but points 4 and 5 are quite similar to point 1; in the same way on p. 128, 5 and 1 are practically identical. On pp. 199 and 200 there are three statements, each of which appears to be contradictory to the other two. Some of the geography is ambiguous, especially that which refers to the western portions of the United States. The author of the book does not seem to realize the magnitude and importance of the area west of the Mississippi River. An illustration is found on p. 403, where the Cambrian rocks are carefully located in the East and then are said to be exposed "in portions of the West." On p. 658 the exact meaning of the figures at the close of the second paragraph is not clear. Illustrations of this looseness and indefiniteness are found on at least thirty-three pages of the book.

Although most of the topics are treated adequately, an effort to obtain brevity has led to incomplete treatment of antecedent streams, p. 102, of tides, p. 202, of the economic importance of metamorphism, p. 351, of the Planetesimal Hypothesis, pp. 386 and 387, of the physical problems of the Ordovician, pp. 418 to 434, of the Red Beds, p. 511, of the economic products of the Miocene, pp. 579 to 580, of the glacial and interglacial stages of the Pleistocene, pp. 648 to 651, and of other equally important topics. On the other hand, many topics are treated with unnecessary detail. The relatively unimportant subjects of geysers, cirques, icebergs, coral reefs, and earthquakes are given too much space. Throughout Part II life is given a more prominent place than physical history. The physical history of the Devonian occupies 4 pages, the life-history, 13 pages; Mesozoic stratigraphy has 15 pages; life, 48 pages; Tertiary history covers 18 pages, Tertiary life, 52 pages.

Perhaps the greatest fault of the book has to do with order. The author has seen fit to exclude separate chapters on lakes, sedimentary rocks, and diastrophism, and to scatter these important subjects through other chapters. The result is disorganization. In Part II the various life-forms are discussed as life-forms rather than as earth inhabitants at stated times in geologic history, resulting in better biologic than geologic treatment. Stream erosion and stream deposition are badly mixed (monadnocks, for instance, on p. 111 belong on p. 105), lacustrine deposits, even peat, the origin of rock salt, extinct lakes, are all discussed under the work of streams; ice in lakes, cuestas, and sedimentary rocks appear nowhere save in the chapter on the ocean; chalk is found under deep sea deposits; hinge faults are separated from other types of fault and included under earthquakes; igneous rocks are classified before minerals are referred to; Pennsylvanian coal is scattered; Cretaceous sequoias are treated in the Tertiary; on pp. 545 and 646, "1. Other Continents" and "2. North America" should be in reverse order.

On the whole, the book shows an excellent attitude toward unsettled and controversial questions. In most cases both sides are fairly stated and the reader is allowed to take either view. The author is orthodox in most of his views. Geologists, however, will tend to disagree with some of his statements, such as the origin of geodes, p. 79, the history of the Tennessee River, p. 117, and the peneplaination of the larger part of North America during the Cretaceous period, pp. 518 to 520. It is doubtful if marble weathers to calcareous clay (p. 350). On pp. 417, 437, 451, and 590 there is intimation and definite statement that climatic zones did not exist until recent stages in the history of the earth; this is easy to write but not so easy to explain. There is grave doubt whether Devonian vulcanism in New England and Nova Scotia had anything to do with Permian diastrophism in the Appalachian Mountains (p. 455). The author of the book will hardly convince the majority of geologists of the unimportance of diastrophism and the relative importance of life-changes in stratigraphic classification and correlation, and especially of the truth of his statement on p. 582 that "the separation of the history of the earth into chapters should be based, not upon the unconformities, however great, but upon the changes which life has experienced." There may be disagreement with the theory of isostacy as explained on pp. 365 to 368 and applied on pp. 132, 472, 478, and 651.

Little but praise should be expressed for the illustrations in the book, for almost all of them are clear and well chosen. Most of them are new, and this feature will be appreciated. There are, however, a few mistakes connected with the illustrations. Fig. 103 pictures as a peneplain a surface which is now known not to be a peneplain. Figs. 142 and 145 seem to be misplaced; they do not illustrate the work of mountain glaciers. Figs. 396 B and 414 B are both labeled "Receptaculites ohioensis"; fig. 414 B illustrates R. oweni. The illustrations of various principles described in words, which occur throughout the book, are numerous, well chosen, and altogether laudatory.

There is no general plan for presentation of references in the book. Footnotes giving definite references on specific points are practically wanting. A few general references are given at the ends of chapters in Part I and at the ends of smaller divisions within chapters in Part II. In some cases previously published material is quoted, with or without the name of the author, but without specific reference. Much material is taken from classic geological literature without reference; for instance, material on the geomorphology of the Appalachian Mountains, Murray's classification of marine sediments, metamorphism, the bar theory for salt formation, and the Lafayette formation. The book would be of much greater value as a work of reference if more care had been taken with sources.

As in the case of any such work, Professor Cleland's book has its good points and its points of weakness, in which the good points outnumber and outweigh those of the opposite character.

A. C. T.

Mine Waters. By A. C. LANE. Ann. Rept., Board Geol. and Biol. Surv. (1911), pp. 774-779.

The study of mine waters in the copper district of northern Michigan is of practical interest, first, owing to the effect on boilers of the admixture of the lower strongly saline waters with those of upper levels; secondly, because it seems clear that the character of the water has had a considerable importance in the deposition of the copper. Observation